CALIFORNIA DIVISION OF MINES AND GEOLOGY

FAULT EVALUATION REPORT FER-83

April 5, 1979

1. Name of Fault

Imperial

2. Location of Fault

South-central Imperial County (Brawley, El Centro, Holtville West, Calexico, Bonds Corner quadrangles; Figure 1).

3. Reason for Evaluation

Part of 10-year Fault Evaluation Program and new information on locations of fault traces.

4. References

Allen, C.R., Wyss, M., Brune, J.N., Grantz, A., and Wallace, R.E., 1972, Displacements on the Imperial, Superstition Hills, and San Andreas faults triggered by the Borrego Mountain earthquake *in* The Borrego Mountain earthquake of April 9, 1968: U.S. Geological Survey Professional Paper 787, p. 87-104, Figure 54 (scale 1:160,000).

Brune, J.N., and Allen, C.R., 1967, A low stress-drop, low magnitude earthquake with surface faulting: The Imperial, California, earthquake of March 4, 1966: Bulletin of the Seismological Society of America, Volume 57, No. 3, p. 501-514.

Dibblee, T.W., 1954, Geology of the Imperial Valley region, California, p. 21-28 in Jahns, J.H., ed., Geology of southern California: California Division of Mines Bulletin 170, Chapter 2, 160 p.

Fairchild Aerial Photos, 1937, Vertical black and white photos, C-4650, 13-ABN 5-90 to 5-98 and 7-16 to 7-19, scale 1:20,000 (approximately). (Photos borrowed from Whittier College.)

Sharp, R.V., 1977, Holocene traces of the Imperial fault in south-central Imperial County, California: U.S. Geological Survey Open File Report 77-815, 5 sheets (scale 1:24,000).

Smith, D.P., 1978, Fault Evaluation Report FER-78 (Brawley fault): Unpublished report of California Division of Mines and Geology, 6 p., 4 Figures.

## 5. Literature Review and Aerial Photo Interpretation

Based on the work of Allen, and others (1972, Figure 54), the Imperial fault was zoned under the Alquist-Priolo Special Studies Zones Act of 1972. New data by Sharp (1977) have indicated that the fault traces based on Allen, et. al. are locally mislocated. This was verified by R.V. Sharp (p.c., 1979), who stated that he mapped the Imperial fault traces using early, pre-grading aerial photos and check his locations on the ground and against the unpublished notes of others (see Sharp, 1977). Specifically, he stated that his observations were in close agreement with the notes of J.P. Buwalda (who made detailed observations of the 1940 fault-rupture event but did not have accurate base maps available to plot the observational data at that time). Moreover, continued active faulting during and since 1968 have coincided with Sharp's (1977) fault traces. According to Sharp (p.c. 1979), Allen compiled Figure 54 (from Allen, et. al., 1972) based on the fault-rupture locations identified in Buwalda's 1940 notes. This apparently was done with little or no field mapping and prior to the 1968 earthquake (which reactivated the Imperial fault).

The fault traces shown in

The trace locations of Sharp have been checked against CDMG's Special Studies Zones maps of 1974 and significant differences were noted with the fault traces shown (based on Allen, et. al.) on the Brawley and Holtville West quadrangles (Figure 1). Fault trace agreement was fairly good on the El Centro, Calexico and Bonds Corner quadrangles.

The differences are shown on Figure 2 and 3 of the Holtville West and Brawley quadrangles. On the former, Sharp's trace is as much as 400 feet southwest of Allen, et. al. north of Interstate Highway 8. On the Brawley quadrangle, there not only are differences in trace locations, but some of Sharp's traces extend beyond the existing SSZ.

The location of Sharp's principal fault traces and associated fault scarps in the Brawley quadrangle are observable on Fairchild (1937) aerial photos. The recent fault trace was not distinct on the photos available for the Holtville West quadrangle north of Highway 80. No photos south of Highway 8 were available for interpretation.

Field checking was not made by CDMG in view of the limited time available. Nor was field work considered necessary in view of the rather complete data available on the Imperial fault and its 1940, 1966, and 1968 rupture locations (Brune and Allen, 1967; Allen, et. al., 1972; Sharp, 1977).

The short segment of the Superstition Hills fault in the southwest corner of the Brawley SSZ Map, which was based on Dibblee, 1954, (Figure 3) was difficult to re-evaluate as it lies in the channel of New River. Sharp (p.c., 1979) stated that he could find no evidence of the fault in the banks of New River, but because of incomplete exposures, he could not disprove the existence of the fault. The fault was active several miles to the northwest in 1968 (Allen, et. al., 1972, p. 91-95 and pl. 2).

The segment of the Brawley fault on the Holtville West SSZ map was recommended for new zoning by Smith (1978).

## 6. Conclusions

The Imperial fault traces of Sharp (1977) in the Brawley and Holtville West quadrangles are significantly different from the traces shown by Allen, et. al. (1977) and shown on these corresponding SSZ maps. The differences are not so great (generally less than 200 feet) on the El Centro, Calexico and Bonds Corner quadrangles.

## 7. Recommendations

Based on the data presented, it is recommended that the 1974 SSZ Maps of the Brawley and Holtville West quadrangles be revised primarily based on the work of Sharp (1977). The SSZ Maps of the El Centro, Calexico, and Bonds Corner quadrangles do not warrant rezoning.

8. Report written by E.W. Hart, 4/5/79.

Earl W. Hart

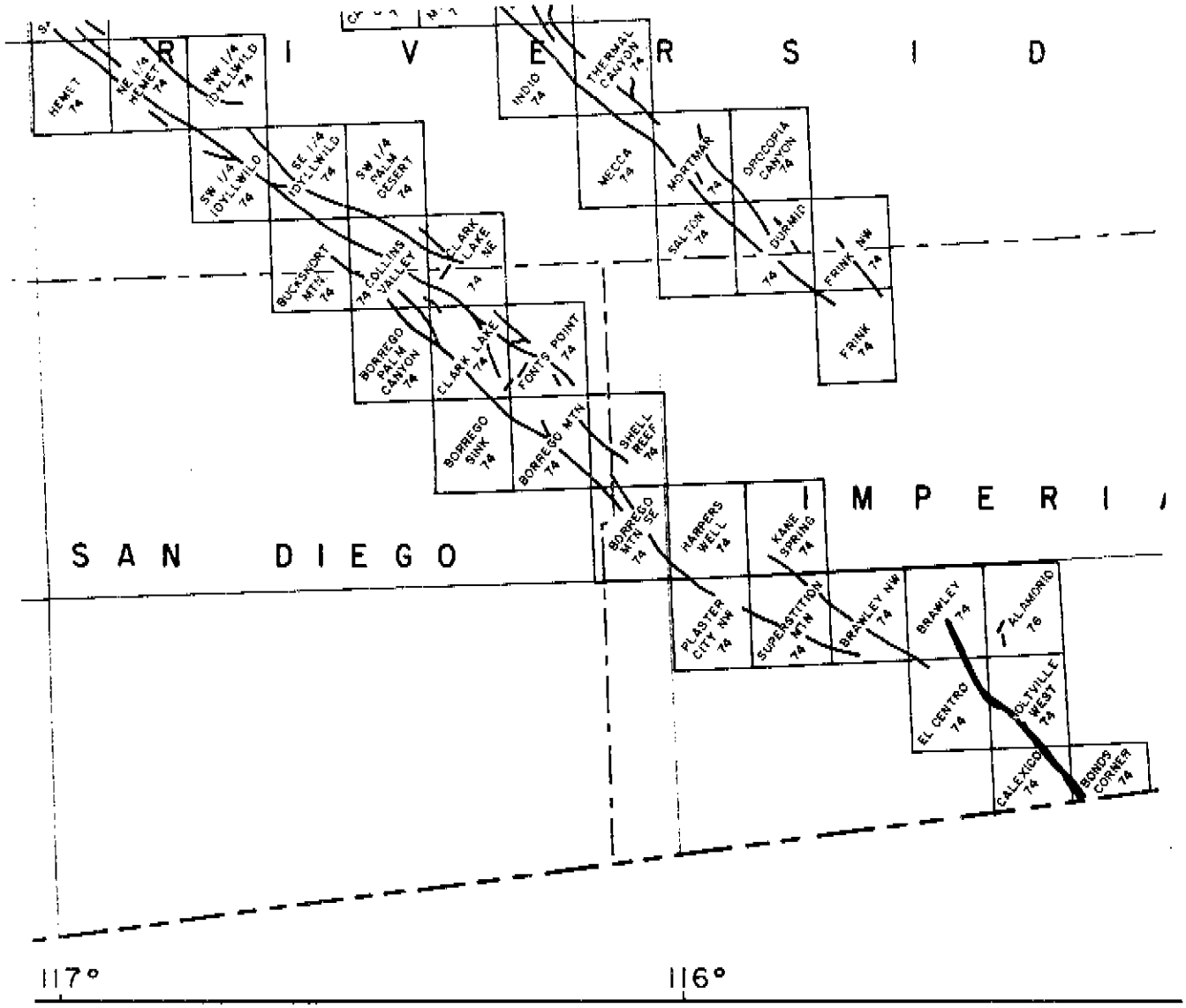


Figure 5G. Index to maps of Special Studies Zones.

EXPLANATION

Faults zoned for special studies

Quadrangle name of Official Map, number indicates year issued (74=1974); R indicates a Revised Official Map.

NOTE: Data used to delineate special studies zones are subject to continual review. Future revisions and additions may be made by the State Geologist. The latest index map should be consulted for information on the availability of special studies zones maps. Further information is available from the State Geologist, California Division of Mines and Geology, Room 1341, 1416 Ninth Street, Sacramento, CA, 95814.

Scale 1:1,000,000

1 inch equals approximately 16 miles

Figure 1 to FER-83. Location of Imperial fault and Special Studies Zones of 1974 (from Special Publication 42).